

Unalakleet and St. Michael

Herring Project, 1987

By

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Regional Information Report¹ No. 3N88-02

Alaska Department of Fish and Game
Commercial Fisheries Division
Nome, Alaska

February 1988

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INTRODUCTION

The usual Klikitarik field crew became "mobile" this year due to changing ice conditions and test fishing needs within the Norton Sound District (Figure 1). Test fishing began May 21 in the Unalakleet subdistrict with the first herring caught May 25 in the same area. The roving crew continued test fishing in subdistricts 1, 2, and 3, setting up temporary camps at Golsovia, Cape Denbigh, and St. Michael. Crew members also changed frequently depending upon availability.

The primary purpose of the mobile field crew was to sample herring test fish catches for gonad ripeness prior to the commercial fishery opening, and for AWL data. Other duties included commercial catch sampling, spawn deposition assessment, observing aboard volunteer commercial test fishing ventures, and patrolling commercial fishing periods with a Fish and Wildlife Protection officer. Data collected in the Cape Denbigh subdistrict has been incorporated into the Cape Denbigh Project Report.

SEASON SUMMARY

Test Fishing

Test fishing in the Unalakleet and St. Michael subdistricts varied greatly with respect to time, location, and climatic conditions (Figure 2). Set techniques were altered or modified in order to target herring that were exhibiting different behavior or maturity stages. Therefore, combined data totals do not necessarily represent a typical sample.

Test fishing was done using a 100 foot floating variable mesh gill net. The net was made up of four 25 foot panels with mesh sizes 1-1/2, 2, 2-1/2, and 3 inch stretched measure, respectively. A total of 991 herring were captured during 35.4 hours of fishing, which resulted in an over-all CPUE of 28.2 (Table 1). The 2-1/2 inch mesh was the most productive panel accounting for 73% of the total catch (Table 2). Pacific herring made up 99% of all pelagic species caught.

Two hundred seventy-two herring were sampled for age, sex, and gonad maturity. Age was estimated in the field using the 1987 Norton Sound herring length-at-age table which suggested 8 and 9+ year old fish were most abundant. Four year old and younger herring did not seem to be present in the samples (Table 3). Scales were also taken from all samples for post-season age determination.

The greatest difference between the age data estimated by length during the season and ages based on post-season scale reading (Tables 4-6) is that average age was less based on the scale data. The six year old age class increased the most, and the eight and nine + classes decreased.

Female herring comprised 45% of the total sample and were assigned a gonad index value to compare gonad maturity. Eighty-three percent of the females sampled had ripe ovaries, with sac roe recoveries ranging from 0% to 11.3% (Table 3).

Commercial Herring Fishery

On May 15 the 1987 Norton Sound commercial herring fishing season opened by regulation, but was immediately closed by emergency order to prevent the harvest of unripe fish. Commercial gillnet fishing opened for six hours June 7, and again for one additional hour in the evening. Beach seining was allowed for three hours on June 7 and for two hours on June 8. The Norton Sound fishing district was closed June 8 with a total harvest of 4,082.5 short tons of herring and an 8.0% overall roe recovery.

Commercial catch samples were collected directly from the fishermen during the first commercial gillnet opening in St. Michael's Bay. Thirty herring from each of seven separate catches were sampled. Ages 5, 6, 7, 8, and 9+ year olds comprised approximately 1, 15, 14, 31, and 40 percent, respectively, as estimated using length-at-age tables for all samples combined (Table 2). Forty one percent of the herring sampled were females. Gonad maturities of 2% green, 11% index 5, 84% index 6 (ripe), and 3% spent were observed. The estimated roe recovery for the combined samples was 7.3% (Table 8).

Spawn and Substrate Evaluations

Spawn and substrate evaluations were conducted June 10 and 11 in the St. Michael subdistrict (Figure 3). Herring eggs were present on 75% of the kelp beds examined between Cape Stephens and Black Point. The heaviest spawn deposition was found along the east side of St. Michael's Bay and Liebe's Cove, ranging from 5 to 20 egg layers. The north coast of St. Michael Island had extensive areas of spawn with average numbers of egg layers between 2 and 4. Egg layers progressively decreased from Five Mile Point east to Myoukchuk Point, while Klikitarik, Shorty Cove, Twin Islands, and Black Point had egg layers numbering between 1 and 6 (Table 9).

This survey was done immediately following the major spawn and while minor spawning was still taking place. Therefore, observed egg mortality was very low with practically no grit or algae between eggs. Herring eggs were primarily deposited on Fucus (kelp), but were occasionally found on bare rock especially where

intense spawning occurred on low density kelp beds. Both sides of the Fucus blades seemed to be covered equally by eggs. Kelp appeared to be in good condition throughout the area. Buds were just beginning to form, only a few beds were red, and there was very little ice scouring.

Climatological Observations

Climatological observations were made daily or when convenient, usually at each test fish site (Table 10). Drifting ice was a major factor this year for both test and commercial fishing. Ice restricted travel and excluded commercial fishing in commonly fished areas of the St. Michael subdistrict such as Klikitarik. Many nets were destroyed and some were abandoned.

Camp Comments

Since no permanent camp was set up this year, the 6-man Eureka tent was used extensively. A strong gust of wind rolled it across the tundra with two people inside. As a result most of the D-rings and grommets were pulled out and the tent poles were slightly bent. A new tent will be needed before long. Personnel should always be aware that weather can change dramatically in a short time as it comes across the flats.

The new twin 70 hp Johnson motors were a real pleasure to run this year. It was comforting to have dependable equipment since Norton Sound is such a large district and long distances have to be traveled often. Now that ADF&G runs primarily this model of motor, a service manual should be purchased in case field repairs are necessary.

Fuel Consumption

Approximately 3 gallons of Blazo, 5 gallons of kerosene, 250 gallons of regular gas and 12 gallons of 2-cycle motor oil were used.

Personnel

Fred Bue - Project Biologist
Rich Cannon - Regional Management Biologist
Mark Rockwell - Volunteer
Tracy Lingnau - Fisheries Technician

Table 1. Variable mesh gillnet catch composition and effort by set and area, Unalakleet and St. Michael subdistricts, Norton Sound District, 1987.

Unalakleet Area													
1987 Date	Set No.	Time Set	Hours Fished	Water Temp (F)	Depth (ft.)	Percent a/ Herring	CPUE Herring/Hr.	Ph	Wf	Catch b/ Scu	Poa	Gr	Char
5/21	1	1225	0.9	34	14								
5/21	2	1256	1.2	36	23								
5/23	3	1337	2.3	36	18								
5/25	4	1224	4.7	36	13	100	0.4	2					
5/25	5	1231	4.7	36	-								
5/27	6	1125	3.3	41	8)	combined							
5/27	7	1135	3.3	41	15)	99	17.1	113		1			1
Area subtotals			20.4			99	5.6	115	0	1	0	0	1
Golsovia Area													
1987 Date	Set No.	Time Set	Hours Fished	Water Temp (F)	Depth (ft.)	Percent Herring a/	CPUE Herring/Hr.	Ph	WL	Catch b/ Scu	Poa	Gr	Char
5/29	1	0515	1.0	38	9	0	0						
5/29	2	0535	0.8	38	12	100	3.0	3			1		
5/29	3	0755	0.8	40	14	0	0						
5/29	4	1020	1.6	40	10	100	1.3	2					
5/29	5	1440	1.2	41	10	0	0		1	1			
5/29	6	1450	1.3	41	15	100	1.5	2					
5/30	7	1045	5.5	41	13	100	99.1	545		2		3	
5/30	8	1510	1.7	40	13	90	22.9	39					1
Area subtotals			13.9			100	42.5	591	1	3	1	3	1
St. Michael Area													
1987 Date	Set No.	Time Set	Hours Fished	Water Temp (F)	Depth (ft.)	Percent Herring a/	CPUE Herring/Hr.	Ph	WL	Catch b/ Scu	Poa	Gr	Char
6/10	9	1215	0.1	37	7	100	110.0	11					
6/10	10	1252	0.2	37	10	100	80.0	16		1			
6/10	11	1316	0.3	37	10	-	-	0					
6/10	12	1348	0.1	37	8	100	110.0	11					
6/11	13	1210	0.4	40	10	100	617.5	247					
Area subtotals			1.1			100	259.1	285	0	1	0	0	0
Combined area totals			35.4			99.7	28.2	991	1	5	1	3	2

a/ Percent composition of herring of the pelagic species catch (pelagic species include Pacific herring, whitefish, and char).
b/ Catch Code: Ph - Pacific herring; Wf - Whitefish; Scu - Sculpin; Poa - Poacher; Gr - Greenling.

Table 2. Percent herring caught in test nets by mesh size, Unalakleet and St. Michael subdistricts, Norton Sound district, 1987.

Date	Location	Number Caught	Mesh size (inches)				Bagged or dropouts
			1.5	2.0	2.5	3.0	
5/25	Unalakleet	2	0	0	0	100	
5/27	Unalakleet	113	0	16	79	5	
Area total		115	0	16	77	7	
5/29	Golsovia	7	0	14	86	0	
5/30	Golsovia	545	0	8	75	17	
5/30	Golsovia	39	0	28	56	16	
Area total		591	0	9	74	17	
6/10	St. Michael	38	0	5	58	24	13
6/11	St. Michael	247	0	17	68	11	5
Area total		285	0	15	67	12	6
Combined totals		991	0	12	73	13	2

Table 3. Percent age composition, gonad maturity, and roe recovery of herring captured by test nets in Unalakleet and St. Michael subdistricts, Norton Sound district, 1987.

Date	Location	Number Sampled	Est. % Age Composition a/					Percent Females	Gonad Maturity Index				% Roe Recovery
			5	6	7	8	9+		3&4	5	6	7&8	
5/25	Unalakleet	2	0	0	50	50	0	100	100	0	0	0	0
5/27	Unalakleet	113	0	13	22	31	34	48	6	50	42	2	9.7
Area total		115	0	13	23	31	33	50	9	48	41	2	9.5
5/29	Golsovia	7	0	29	14	14	42	57	75	0	0	25	0
5/30	Golsovia	30	7	17	13	27	37	47	14	29	43	14	6.6
5/30	Golsovia	60	2	7	13	40	38	38	4	48	30	17	6.6
Area total		97	3	11	13	34	38	42	15	37	32	17	6.1
6/10	St. Michael	30	17	20	10	27	27	47	0	0	100	0	11.3
6/11	St. Michael	30	13	20	13	30	23	33	0	0	50	50	4.5
Area total		60	15	20	12	28	25	40	0	0	79	21	7.9
Combined totals		272	5	15	17	33	30	45	7	37	46	10	

a/ Age estimated from historical length frequency data.

Table 4. Age, sex and size composition of Pacific herring captured by commercial gill nets in St. Michael Subdistrict, Norton Sound District, 1987.

Sample Period	Age (years)	Sex			Percent		Weight			Std. Length		
		Male (No.)	Female (No.)	Unknown (No.)	Total	of Total	Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured
6/ 3- 6/ 9	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	2	1	-	3	1.5	203	38.2	3	247	18.4	3
	6	24	27	-	51	25.6	237	25.8	51	251	20.2	51
	7	19	14	-	33	16.6	274	36.4	33	265	9.6	33
	8	42	28	-	70	35.2	290	36.4	70	270	9.5	70
	9	18	7	-	25	12.6	306	39.6	25	276	10.6	25
	10	12	5	-	17	8.5	337	58.1	17	285	11.5	17
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		117	82	-	199	100.0	279	47.7	199	266	16.9	199

Table 5. Age, sex and size composition of Pacific herring captured by variable mesh gillnets in St. Michael Subdistrict, Norton Sound, 1987.

Sample Period	Age (years)	Sex			Percent of		Weight			Std. Length		
		Male (No.)	Female (No.)	Unknown (No.)	Total	Total	Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured
5/27- 6/ 2	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	4	-	-	4	4.2	197	39.7	4	243	9.3	4
	6	11	6	-	17	17.7	241	38.5	17	254	7.8	17
	7	10	5	-	15	15.6	275	36.5	15	262	6.1	15
	8	13	15	-	28	29.2	314	46.4	28	271	9.8	28
	9	11	11	-	22	22.9	323	36.3	22	275	7.3	22
	10	5	4	-	9	9.4	323	32.2	9	276	10.9	9
	11	1	-	-	1	1.0	347	-	1	287	-	1
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		55	41	-	96	100.0	293	52.7	96	267	12.4	96
6/10- 6/16	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	4	3	-	7	12.7	163	23.9	7	221	8.2	7
	6	10	5	-	15	27.3	210	31.1	15	246	8.3	15
	7	2	3	-	5	9.1	253	46.3	5	259	9.4	5
	8	7	8	-	15	27.3	278	48.3	15	269	6.5	15
	9	7	1	-	8	14.5	305	28.6	8	274	7.7	8
	10	-	4	-	4	7.3	315	68.8	4	269	11.1	4
	11	1	-	-	1	1.8	384	-	1	292	-	1
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		31	24	-	55	100.0	251	63.8	55	258	17.1	55
All periods	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	8	3	-	11	7.3	175	33.3	11	235	10.1	11
	6	21	11	-	32	21.2	227	34.8	32	251	8.6	32
	7	12	8	-	20	13.2	270	39.1	20	262	6.9	20
	8	20	23	-	43	28.5	301	49.8	43	271	8.8	43
	9	18	12	-	30	19.9	318	33.5	30	274	7.3	30
	10	5	8	-	13	8.6	321	40.4	13	273	11.0	13
	11	2	-	-	2	1.3	366	26.2	2	290	3.5	2
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Total		86	65	-	151	100.0	278	60.3	151	264	14.9	151

Table 6. Age, sex and size composition of Pacific herring captured by variable mesh gill nets in Unalakleet Subdistrict, Norton Sound District, 1987.

Sample Period	Age (years)	Sex			Percent of Total		Weight			Std. Length		
		Male (No.)	Female (No.)	Unknown (No.)			Mean (gm)	Std. Dev.	Number Weighed	Mean (mm)	Std. Dev.	Number Measured
5/28- 5/26	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-	-	-
	8	-	1	-	1	50.0	302	-	1	265	-	1
	9	-	1	-	1	50.0	352	-	1	273	-	1
	10	-	-	-	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		-	2	-	2	100.0	327	35.4	2	269	5.7	2
5/27- 6/ 2	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	1	1	-	2	1.9	284	2.8	2	248	.7	2
	6	8	7	-	15	14.3	227	29.8	15	249	10.3	15
	7	12	10	-	22	21.0	266	38.5	22	259	9.7	22
	8	16	20	-	36	34.3	291	44.8	36	266	8.9	36
	9	11	11	-	22	21.0	317	38.4	22	274	6.1	22
	10	6	2	-	8	7.6	355	38.8	8	278	9.7	8
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Period total		54	51	-	105	100.0	285	52.7	105	264	12.6	105
All periods	1	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-
	5	1	1	-	2	1.9	284	2.8	2	248	.7	2
	6	8	7	-	15	14.0	227	29.8	15	249	10.3	15
	7	12	10	-	22	20.6	266	38.5	22	259	9.7	22
	8	16	21	-	37	34.6	292	44.3	37	266	8.8	37
	9	11	12	-	23	21.5	318	38.2	23	273	6.0	23
	10	6	2	-	8	7.5	355	38.8	8	278	9.7	8
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13+	-	-	-	-	-	-	-	-	-	-	-
Total		54	53	-	107	100.0	286	52.7	107	264	12.5	107

Table 7. Percent composition by age of sampled herring captured by commercial gill nets in St. Michael subdistrict, Norton Sound district, June 7, 1987. a/

Sample Number	Number Sampled	Percent Age Composition				
		5	6	7	8	9+
1	30	0	7	7	33	53
2	30	0	7	13	40	40
3	30	0	3	13	33	50
4	30	0	3	17	37	43
5	30	0	17	17	26	40
6	30	3	30	23	23	20
7	30	0	37	10	20	33
Total combined percentages	210	1	15	14	31	40

a/ Age estimated from historical length frequency data.

Table 8. Percent gonad maturity and roe recovery of herring captured by commercial gill nets, St. Michael subdistrict, Norton Sound district, June 7, 1987.

Sample Number	Number Sampled	Percent Female	Estimated % Roe Recovery	Gonad maturity Index, (%)			
				Green 3&4	Ripe 5	6	Spent 7&8
1	30	40	8.6	0	0	100	0
2	30	37	7.5	0	0	100	0
3	30	40	7.0	0	8	92	0
4	30	47	9.3	0	21	79	0
5	30	33	5.0	0	20	70	10
6	30	47	7.8	0	21	79	0
7	30	43	5.7	15	8	70	8
<hr/>							
Total combined percentages	210	41	7.3	2	11	84	3

Table 9. Description of spawn and spawn substrates, St. Michael subdistrict, Norton Sound district, 1987.

Date	Location a/	Tide Stage	Fucus b/ Conc.	Patch Length (mi.)	Width (ft.)	% Egg Coverage	Avg. # Egg Layers	% Egg Mortality	Remarks
6/10	1	mid	3	1/8	10 - 30	75	1 - 2	<5	eggs in lower 2/3 of bed
6/10	2	mid	2 - 3	1/2	-	-	-	<5	small spawn taking place
6/10	3	mid	3	1/4	10 - 30	75	1 - 2	<5	
6/10	4	mid	3	1	10 - 20	90	3 - 6	<5	
6/10	5	low	3 - 4	1	5 - 15	75	2 - 4	<5	
6/10	6	low	2	1/4	5 - 10	100	2 - 4	<5	eggs on kelp and bare rock
6/10	7	low	2 - 3	1/4	5 - 10	75	2 - 3	<5	
6/10	8	low	2 - 3	1/8	5 - 10	75	2 - 3	<5	
6/10	9	low	2 - 3	1/2	5 - 15	75	2 - 3	<5	
6/10	10	low	2 - 3	1/4	5 - 10	75	2 - 3	<5	some red kelp areas
6/10	11	low	3 - 4	1/2	10 - 30	100	6 - 14	<5	very clean eggs
6/10	12	low	3 - 4	3/4	10 - 20	100	10 - 20	<5	complete coverage
6/10	13	mid	3	1/2	5 - 15	100	5 - 8	<5	
6/11	14	mid	3	1/4	-	75	2 - 3	<5	small spawn taking place
6/11	15	mid	2 - 3	1/4	5 - 10	50	1 - 2	<5	
6/11	16	mid	2 - 3	1/2	5 - 10	-	-	-	no eggs
6/11	17	mid	2 - 3	1/4	5 - 10	-	-	-	no eggs
6/11	18	mid	2 - 3	1/4	5 - 10	-	-	-	no eggs
6/11	19	mid	2 - 3	1/4	5 - 10	25	1 - 2	<5	
6/11	20	mid	1 - 2	1/8	5 - 10	-	-	-	no eggs
6/11	21	mid	1 - 2	1/8	5 - 10	-	-	-	no eggs
6/11	22	low	1 - 2	1/8	5 - 10	-	-	-	no eggs
6/11	23	low	3 - 4	1	5 - 20	75	3 - 6	<5	
6/11	24	low	3 - 4	1/2	5 - 15	50	1 - 2	<5	
6/11	25	low	3 - 4	1/4	-	75	3 - 5	<5	small spawn taking place
6/11	26	low	3	1/4	5 - 10	50	1 - 3	<5	

a/ Locations by site number between Cape Stephens and Black Point.

b/ Qualitative assessment; 1 - very light, 2 - light, 3 - medium, 4 - heavy.

Table 10. Climatological observations at test fish sites, Norton Sound district, 1987.

Date	Time	Location	Water Temp. (F)	Secchi Reading (m)	Cloud a/ Cover	PPT b/	Wind Direction	Wind Speed (mph)	Remarks
5/21	1348	Blueberry	36	5	3	7	SE	10 - 15	
5/23	1337	Unalakleet	36	1.2	3	7	W	5 - 10	possible river influence
5/25	1224	Blueberry	36	3	-	-	-	-	
5/27	1125	Unalakleet	41	1.5	4	7	NE	5 - 10	possible river influence
5/29	0515	Black Point	38	1.6	4	7	S	5 - 10	
5/29	0955	Tolstoi	40	2.0	4	7	S	10 - 15	choppy seas
5/30	1045	Black Point	41	1.0	4	4	SW	10	seas 3-4 foot swells
5/31	0630	Golsovia	-	-	-	-	-	-	leading edge of drifting ice
6/01 & 6/02		Unalakleet	-	-	4	7	SW	10 - 20	seas 3-4 feet and capping
6/03	1130	Junction Creek	43	0.8	5	7	-	0	strong current
6/03	2100	Cape Dexter	34	-	-	-	-	-	near ice in Norton Bay
6/03		Unalakleet	-	-	-	-	-	-	ice across Unalakleet River mouth
6/04	1200	Cape Dexter	46	3.0	1	7	variable	0 - 5	
6/07	1030	St. Michael	43	-	4	7	-	0	drifting ice
6/08 & 6/09		St. Michael	-	-	2-3	7	variable	gusty	bay plugged with drifting ice
6/10	1215	Cape Stephens	37	4.0	4	7	-	0	drifting ice
6/11	1210	Fivemile Point	40	-	2	7	SW	5	spawn taking place, midtide

a/ cloud cover: 0 - No observation
 1 - Less than 1/10
 2 - Not more than 1/2
 3 - More than 1/2
 4 - Completely overcast
 5 - Fog or thick haze

b/ Precipitation (PPT):
 0 - No observation
 1 - Intermittent rain
 2 - Continuous rain
 3 - Snow
 4 - Snow and rain mixed

5 - Hail
 6 - Thunderstorm
 7 - No precipitation